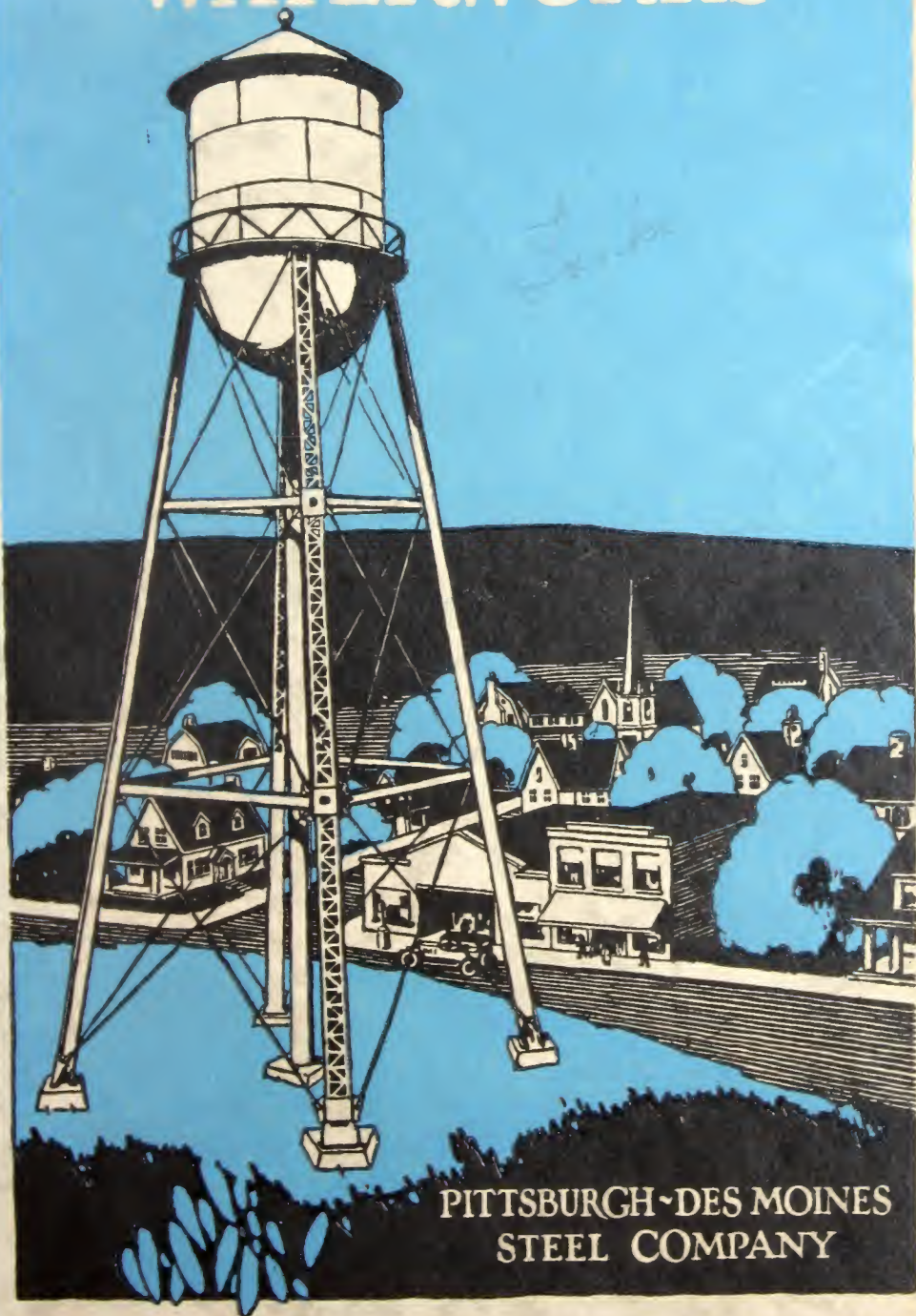


3-9.

# MUNICIPAL WATERWORKS



PITTSBURGH-DES MOINES  
STEEL COMPANY



# MUNICIPAL WATERWORKS

Pittsburgh-Des Moines Steel Company

Pittsburgh, Pennsylvania

Des Moines, Iowa

SALES OFFICES

Des Moines

Chicago

Detroit

San Francisco



Pittsburgh

New York

Richmond

Dallas

1924



## What a Water Supply Means to a Community

**A**N adequate supply of clear, pure water is absolutely necessary to a modern progressive community today. It is the most important public utility that a town can possess, because upon it rests the health and prosperity of all the inhabitants. There must be sufficient water for domestic and industrial needs, and also for fire protection, if the people are to live in comfort and safety.

**A**

**Vital**

**Necessity**

A properly built waterworks system guarantees to each individual in the community comfort, health and dependable protection against fire, while an insufficient supply endangers life and property, and causes great inconvenience to everyone. No community can excuse a poor waterworks system on the plea that it cannot afford the necessary improvements. Improving an unsatisfactory waterworks will more than repay the cost of the work within a very short time. In any community where the water system is modern and adequate for the needs of the people, fire insurance rates are low, the value of property high, and the town a comfortable and attractive place in which to live and work. People seek out such a community for a home. Industries will come to a town which offers to safeguard the health of their employees as well as to supply fire protection and plenty of good water for their factories. The progressive community of today realizes that a modern waterworks system is its greatest single asset.

**Economy**

## Advantages of the Gravity Pressure Water System

**I**F an ample supply of pure water is available at a proper elevation, and not too far distant from the town, the design of the waterworks system becomes simple; the water will flow through an impounding reservoir or directly into the distribution system with-

### Nature's Way

out the aid of machinery, under the force of gravity. Such ideal conditions are, however, very seldom available. Usually a pumping station is necessary to lift the water from a well or other source of supply to an elevated



Elevated steel tank.

tank or reservoir. When the water is thus stored, it is available for immediate use under pressure. This arrangement, with the usual distributing pipes, valves, and hydrants, is known as a gravity pressure waterworks system.

If the water is not clear or pure, a filter plant is also necessary to purify the supply before it is pumped into the elevated tank or other storage.

Pumping water directly into the distributing system for domestic use and fire service without the use of an elevated tank or reservoir—known as a direct pressure system—is, in most cases, unsatisfactory and inefficient. The quantity and pressure of the water depend entirely upon the operation of the pump which, therefore, must be sufficiently large and powerful to handle the maximum requirements. Naturally, the pump cannot always respond at once to every unusual demand, and the pressure, instead of being uniform, fluctuates throughout the system. When, as frequently occurs in such a system, the flow of water is suddenly reduced and

### More Efficient than Direct Pressure

as suddenly increased, the machinery, water mains and service pipes are subjected to heavy strains by water hammer, which may cause serious damage.

If the water is stored at an elevation, as in an elevated steel tank, it is always available for immediate use at uniform pressure, and the community is not directly dependent upon the successful operation of machinery for its supply.

Pumping into an elevated tank is also more economical than "direct pumping", because the pump always works under a uniform load and at maximum capacity. With an elevated tank, pumping is usually not required during the entire twenty-four hours, and the cost of power and supervision is greatly reduced. Where electric power is available, automatic remote controls for the pumps are usually installed which operate as follows: when the water in the tank falls to a predetermined level a pressure regulated control device mounted on the tank operates an automatic electric switch in the pump house, starting the pumps, and stopping them when the tank is full. This arrangement can be adapted to practically all conditions, even though the pump house and water tower are located several miles apart. With such an installation only occasional visits to the pump house for oiling and inspection are necessary. Necessary repairs may be made while the pump is idle so that duplicate pumping units are unnecessary. A large tank and a small pump are better than a small tank and a large pump, because their operation is safer and more economical.

The strongest argument in favor of the gravity pressure system is its absolute dependability for fire protection. How often have you read of or seen a disastrous conflagration which got beyond control because, at a critical time, the wells, pumps, or power failed? The demands upon some part of the system proved too great just when water was most needed. Such a disaster is practically impossible with a properly designed gravity system, for the force of the water stream is always dependable. For reliable fire protection, a gravity pressure system is by far the safest and most reliable.

## Elevated Steel Water Tanks for Municipal Service

**A** Pittsburgh-Des Moines elevated steel water tank is the efficient and economical water storage system for industrial and domestic use and for fire protection. In the average town of approximately ten thousand population, the elevated steel tank is almost

### Efficient and Eco- nomical

invariably a part of the modern waterworks system. In the larger cities also, water towers are being used extensively as auxiliary units of the main water system to provide efficient fire protection for outlying or isolated districts, and for carrying "peak loads" of water consumption.

A standard Pittsburgh-Des Moines elevated steel water tank consists of an all-steel tank with a hemispherical bottom supported upon a steel tower, the whole being constructed as a single unit. The tower consists of four or more sloping steel columns, their bases

### Tower Design

securely anchored to concrete foundation piers. The number of columns varies with the size of the tank, as many as twelve being used for very large capacities. The tower is wind-braced by steel struts and rods, and at its juncture with the tank is usually reinforced by a horizontal, circular steel girder, with a railing, which is called the balcony. The tank is provided with a steel roof to prevent contamination from outside sources and to maintain a uniform temperature of the water. When the elevation of the tank is not more than three times its diameter, the columns may be vertical instead of sloping, in which case the balcony is usually not required. In all of these structures the stresses are scientifically calculated to determine the size of members and the thickness of plates which must be used to give the structure a wide margin of safety. Proper ladders are supplied to provide easy access to all parts of the structure.

A standard Pittsburgh-Des Moines tank has a hemispherical bottom; this shape has smaller and more easily calculated stresses



Paris, Texas—City Waterworks

Standard Vertical Post Design.

Capacity—500,000 gallons. Height—86 feet, 4 inches to bottom of tank.

## Tank Design

than any other flat or curved surface. It is self cleaning and also very economical in weight of metal and cost of manufacture. When required, we can supply conispherical, elliptical or other shapes of bottoms having complex curves, but our standard hemispherical type is most generally used.

The tank is usually connected to the water mains by a single vertical riser pipe, protected by a wooden frost case which has the

## Riser Pipe

proper number of air spaces to protect the water against freezing. Sometimes all-steel riveted riser pipes of large diameters are used, without frost cases; the large diameter effectively prevents the water freezing at the center of the pipe. This large riser acts as a catch basin for any sediment in the water and can be quickly cleaned at any time by means of a blow-off valve connected to the sewer, without interrupting the service. The steel riser is provided with a manhead, allowing convenient access for inspection and painting.

These elevated tanks may be constructed with capacities ranging from 1,000 to more than 1,000,000 gallons, and with heights up to 300 feet. For municipal service the usual capacities are from 30,000 to 500,000 gallons with elevations of 75 to 150 feet. A list of Pittsburgh-Des Moines standard tanks will be found on page 39.

## Heights and Capacities

Wood tanks on steel towers can be replaced with steel tanks, as shown in the illustration of the Lohrville tank and tower

## Replacement of Wood Tanks with Steel

on the opposite page. Occasionally we are called upon to replace wood tanks on masonry towers; the Kasson, Minnesota job—shown on page 10—is an illustration of the success with which this can be done. In practically every instance it will be found more economical to replace with a steel tank than to repair the old wood tank or replace it with a new wood tank. Steel tanks cost but little more than wood and last indefinitely, while wood tanks must be repaired at frequent intervals and usually must be entirely replaced after ten or twelve years.



Lohrville, Iowa

Replacement of wood tank. Height of tower increased and new steel tank installed.



Kasson, Minnesota

This stone tower formerly supported a wooden tank which was replaced by us with this hemispherical bottom steel tank.



Rochester, N. Y.—Homeopathic Hospital

Standard Design.

Capacity—50,000 gallons. Height—100 feet to bottom.

## A Complete Waterworks Service for the Municipality

**M**ANY difficulties face the public officials who are responsible for the construction, improvement and maintenance of the waterworks system of a community. Through long experience, the Pittsburgh-Des Moines Steel Company has developed a complete service to care for every phase of a municipal waterworks installation. For more than thirty years we have been known throughout the United States and Canada as manufacturers and erectors of elevated steel water tanks and standpipes, and also as contractors for complete waterworks systems. Our contracting service embraces every feature of municipal waterworks construction.

### Thirty Years' Experience

A typical waterworks and filtration plant which we recently completed included the fabricating and erecting of two standard Pittsburgh-Des Moines elevated steel tanks, the construction of a power house, the installation of the pumps and the building of a filter plant, including a coagulation basin and rapid sand filters. Another plant included five 1,000,000-gallon steel standpipes, the installation of six miles of large size cast iron pipe with the necessary hydrants and valves and also four miles of 30-in. riveted steel force mains. Work in connection with the standpipes consisted of the excavation of 25,000 cubic yards of earth for the foundation site, and the construction of the concrete foundations themselves. We also installed the automatic electric control equipment for maintaining the proper level of water in the standpipes at all times.

### Complete Water- works In- stallation

The Pittsburgh-Des Moines Steel Company is prepared to handle any waterworks installation from start to finish. We will assist you in selecting the improvements contemplated, and our plans will be backed by our experience in hundreds of communities, small hamlets as well as large cities. We will fabricate and erect the tank

### From Start to Finish

or standpipe, lay the water mains, furnish the well, install the pumps, and do all the work, even to making the domestic service connections. We can handle the entire job promptly, satisfactorily and economically, because of our long experience with every detail of the work. When we make a contract for your plant we want it made because you are convinced that we will render better service than can be obtained elsewhere. None of our products are patented; we do not urge you to specify anything that others cannot build. We are always glad to meet fair and responsible competition. Ten contracting offices, three great fabricating plants at Pittsburgh, Pennsylvania, Des Moines, Iowa, and Chatham, Ontario, enable us to serve every part of the United States and Canada with despatch and economy. An experienced field organization equipped with modern construction machinery insures rapid progress and good workmanship on every job.



Centralia, Missouri

Elevated tank, pumping station and reservoir built by the Pittsburgh-Des Moines Steel Company.

## Standpipes for Municipal Service

**I**F the storage tank can be located on a hill near the town, a steel standpipe will be quite as effective as an elevated tank. For fire protection in the average community, a minimum nozzle pressure of forty to fifty pounds is required, equivalent to a water pressure of about one hundred feet. It is therefore evident that a standpipe on a hill one hundred feet or more above the town will meet this need quite as well as an elevated tank on a hundred foot tower.

### Natural Elevation Available

Standpipes are comparatively simple to manufacture and erect, and large quantities of water can be stored in them at a very low cost per gallon. To secure the greatest economy, however, standpipes should be designed with the height not over twice the diameter. Avoid building standpipes of small diameter and great height, because the pressure will fluctuate greatly and only that part of the water which is at the necessary elevation will be available for use. One objection to a high standpipe in cold climates is that it is impractical to use a roof on account of floating ice, and open top tanks are always dangerous to the public health. There is also danger of failure caused by falling ice on a warm spring day when the level of the water is low.

### Proper Design Important

An elevated tank should always be used if considerable height is necessary. In general a standpipe is not as sanitary and will never do "just as well" as an elevated tank. The only reasonable and economical plan is to erect the type of water reservoir which the local conditions demand. After your consulting engineer has designed the system, the Pittsburgh-Des Moines Steel Company will take over the entire job of constructing your water supply. You will thus be assured of a carefully designed and properly built waterworks system, well fitted to the needs of your community.



San Diego, California  
City Waterworks  
Capacity—493,500 gallons.  
Height—53 feet to top.



Manhattan, Kansas  
Special Ornamental Design  
Standpipe.



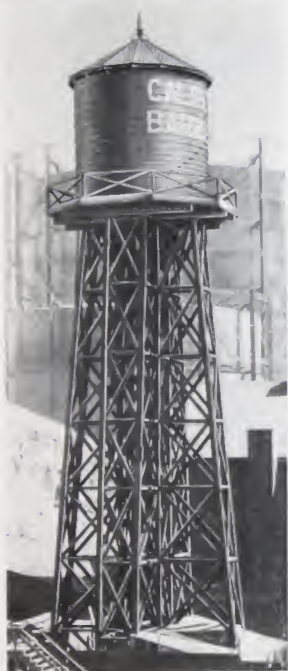
Ft. Hancock — New Jersey  
Capacity—300,000 gallons. Height—43 feet to top.

## Steel Tanks versus Wood or Concrete Tanks

**I**N the early days of the gravity pressure water system the wood tank and tower were widely used throughout this country. Lumber was cheap and of excellent quality. Wood tanks and towers were cheaper than similar structures of steel and little consideration **Steel More** was given to the appearance of the structure. With **Econom-** the increasing scarcity of good timber and advancing **ical** lumber costs, the price advantage of wood tanks and towers disappeared and their quality was greatly reduced. The construction of wood towers has practically been discontinued. At present the initial cost of a standard Pittsburgh-Des Moines steel water tank and tower, even of small capacity, is almost as low as that of a wooden structure of the same capacity and height, and for large structures steel is much cheaper.

A Pittsburgh-Des Moines steel tank will last a life-time with practically no maintenance cost except for painting at three or four year intervals. On the other hand, the effective life of the best wood tank is seldom more than ten years, and constant inspection and repair are necessary during the whole period. Over a term of years the cost of a Pittsburgh-Des Moines steel water tank and tower is much less than that of a wood tank and wood tower, or a wood tank on a steel tower.

A Pittsburgh-Des Moines elevated steel tank is fire-proof, leak-proof and rot-proof, while a wood tank and tower has none of these **Fire-proof** qualities. Unless a wood tank is kept constantly **Leak-proof** filled with water, it will develop leaks that can never **Rot-proof** be entirely repaired. Even under ideal conditions, a wood tank soon begins to leak, wasting water, increasing pumping costs and making the tank unsightly in appearance. Dangerous icicles form on the sides of the tank in winter, and are a menace both to the structure itself and to human life. In many cases wood tanks have been known to burst their hoops,



Old-style wood tank and tower.

waste of water, and a very unsightly appearance of the tank itself. As the process of freezing and thawing continues, particles of the concrete "flake off" until eventually small cracks become large openings and the walls become too thin for safety. Concrete tanks cannot, therefore, be classed as permanent structures for this service. A Pittsburgh-Des Moines elevated steel tank is the safe, permanent and economical way to store any amount of water.

causing great property damage and sometimes loss of life.

A concrete tank is extremely difficult to make permanently water-tight. Even when the concrete is expertly mixed and placed, there is bound to be a certain amount of seepage, due to its porous nature, to cracks caused by the settling of the structure, and by expansion and contraction. Naturally this results in a

### Concrete Tanks Leak



Dallas, Texas—Bellevue Addition

Capacity—30,000 gallons.

Height—75 feet to top.



*Courtesy of Fire and Water Engineering*

#### Cudahy, Wisconsin

General view of wreckage after the bursting of a 1,250,000-gallon reservoir at the Cudahy Packing Plant. Broken concrete in center foreground shows the corners of the reservoir, all that was left standing.



#### El Centro, California

Pittsburgh-Des Moines tank and tower after an earthquake—only slightly damaged, although buildings nearby were partially destroyed.



Humble, Texas—Humble Waterworks  
Standard Design.

## How to Build a Waterworks

**I**N the development of every community the time comes when changing conditions awaken its citizens to the urgent need of a system of waterworks for fire protection and for industrial and domestic use. Usually the task of installing this new system or improving the existing system is entrusted to the public officials of the community. Often enough, these men, although efficient servants of the public in the routine of official duties, find that the task of improving the water supply presents many technical problems which, very naturally, they are not prepared to solve without expert assistance.

### Expert Advice Necessary

In the average community there oftens exists some doubt as to whether a waterworks system can be financed. Until this question is decided, the officials very properly hesitate to employ an engineer. Here is where the Pittsburgh-Des Moines Steel Company can first help you. One of our representatives will gladly consult with your officials without incurring any obligation whatever on your part. If desired, we will examine the local situation, advise the type of system best suited to your community, and submit an approximate estimate of its cost. This information can then be published in the local newspaper or mailed to each voter so that he may be fully advised on the proposed improvements, and be able to act and vote intelligently on the proposition.

### Select an Engineer

When your community has definitely decided to construct a municipal waterworks system, the next step should be to engage an engineer to make a survey of your local conditions and prepare detailed plans and specifications of the proposed improvements. If desired, the Pittsburgh-Des Moines Steel Company will furnish the names of engineers who



Crewe, Virginia—City Waterworks

Standard Design.

Capacity—100,000 gallons. Height—50 feet to bottom.

Because of the elevation of the site, a two-panel tower in this case was sufficient in height to give adequate pressure.

are capable of doing this work for you. Attention should be given to the insurance requirements, to the state laws governing the approval of plans by the board of health, and to the raising of the necessary funds by voting and issuing bonds. Any experienced waterworks engineer can advise you upon these matters.

While the surveys and plans are being made, the officials should arrange to provide the necessary funds. The usual plan for financ-

### Provide Money

ing the work is to vote and sell bonds. In doing this, great care should be taken to have all proceedings legal, in order that the bonds can be sold without difficulty or delay. If it is necessary to sell the bonds at or above par, it is important that the proper rate of interest be fixed. Our extensive experience in the municipal waterworks field enables us to give you valuable advice on this subject. Usually the bonds should be sold before contracts are made for the construction of

the work, since the ordinary contractor or manufacturer will not begin work before the funds are definitely assured. But in order to speed up the completion of the plant or to overcome difficulties due to unfavorable bond market conditions, the Pittsburgh-Des Moines Steel Company is prepared to make contracts for the construction of waterworks systems on the basis of receiving the bonds as payment.



Thompsonville, Connecticut  
Thompsonville Water Company

Standard Vertical Post Design.  
Capacity—500,000 gallons.  
Height—104 feet, 3 inches to top.

After the plans are completed and the money is assured, the next step is to receive public bids and award a contract for the construction of the plant. It is always best to

award a single, complete contract for the entire system. This arrangement places all the responsibility upon one concern, definitely determines the total cost in advance, reduces the cost of the town, and saves the engineer much time and worry.

### Placing the Contract

Good business judgment dictates that a construction contractor be selected who has established a reputation for satisfactory service in this particular field. The Pittsburgh-Des Moines Steel Company has been engaged in waterworks contracting for more than thirty years and has built hundreds of plants in all parts of the United States and Canada. Its reputation for dependable and satisfactory service is shown by the steady increase in its waterworks business over this long period of years.



Lakewood, Ohio

Special Design.

Capacity—560,000 gallons.

Height—70 feet to top.

## Municipal Water Filter Plant

Typical installation constructed by the Pitts



Filter Beds  
and  
Operating  
Floor

Intake Pier  
and  
Traveling  
Screen



## Plant at Covington, Virginia

Pittsburgh-Des Moines Steel Company



Pump  
Floor  
and  
Switch-  
boards

Front Elevation of  
Water Plant Building  
with Coagulation Basin  
in foreground



Chemical  
Room  
and  
Chemical  
Vats



Reedley, California—City Water Works

These two tanks and towers are exactly alike, except that one structure is nine years older than the other. In 1914 we erected one 60,000-gallon storage tank which was then sufficient for the needs of the town. In 1923 we duplicated the first tank to provide for the recent growth of the community.

## Scope of the Pittsburgh-Des Moines Service

**I**N addition to the service which this company renders in the municipal field, we construct highway bridges of structural steel or reinforced concrete. Our organization is well adapted to handle this work. Three great steel fabricating plants, a staff of competent construction engineers and well-organized field crews combine to render prompt, efficient and economical service in this line of work.

**Highway  
Bridges**

When deciding whether the proposed bridge shall be built of steel or of reinforced concrete, a number of factors should be taken into consideration. Depending upon local conditions, and the size and type of the bridge, a concrete structure will sometimes be cheaper than one of steel, or vice versa. Our engineers will gladly submit estimates of both types of construction to help you settle this problem. There is also the question of beauty against that of utility. Where the former is an important factor, reinforced

**Steel or  
Reinforced  
Concrete  
Bridges**



Des Moines, Iowa — East Sixth Street Bridge

Fabricated and erected by the Pittsburgh-Des Moines Steel Company.

concrete will often be used even though the cost be considerably greater than that of steel. We can save you both delay and money if we are called upon early in the planning stage. Our engineers may be able to make suggestions which will radically simplify the work, reduce the cost, and also insure greater safety and permanence to the structure.

For many years we have been fabricating and erecting structural steel and steel plate work for all kinds of public and private buildings. We design and build coal tipples, radio towers, transmission towers, aeroplane hangars and many other types of steel structures. Our three large, modern fabricating shops are located at Pittsburgh, Pennsylvania, Des Moines, Iowa, and Chatham, Ontario, Canada. Their location enables us to make prompt delivery of steel work in all parts of the United States and Canada.



Martinsville, Virginia

Municipal concrete bridge built by the Pittsburgh-Des Moines Steel Company.

At all of these plants we carry a large stock of plates, beams, channels, angles, bars and H-sections ready for immediate fabrication. In this way we are able to speed up delivery and give our customers the prompt, satisfactory service to which they are entitled.

**Steel  
Shapes  
in Stock**

All kinds of steel smoke stacks, breechings, caissons, oil refinery equipment and steel barges are among our regular products. If you have occasion to purchase any of the above type of work, we will be glad to make preliminary cost estimates or quote upon the work without any obligation on your part.

**Steel  
Stacks,  
Plate Work  
of All  
Kinds**

We have built many varieties of tanks and many miles of penstocks for hydro-electric power plants. We are glad to furnish preliminary estimates or quote upon this class of work and can assure you of thoroughly satisfactory service.

**Surge  
Tanks and  
Penstocks**

Our specialty is steel tanks—elevated steel water tanks, stand-pipes, and storage tanks for oil or other liquids. When you plan



Los Angeles, California—United States Post Office  
Fabricated by the Pittsburgh-Des Moines Steel Company.



Colton, New York— Surge Tank  
Northern New York Utilities Company

to purchase a tank of any kind, get in touch with the Pittsburgh-Des Moines office nearest **Steel Tanks** you; we will gladly estimate and quote on your requirements. The Pittsburgh-Des Moines Steel Company has established an enviable reputation for its products and its service during the past thirty years. No matter what type or size of work we undertake, the result will be entirely satisfactory to you.



Fairport, New York— City Waterworks

The Pittsburgh-Des Moines Steel Company constructed a gravity supply line and laid 11 miles of 12 and 16 inch universal cast iron pipe on this contract.

## Pittsburgh-Des Moines Tanks for Oil Storage



Five Ring Tanks  
Capacity—55,000 barrels



Vertical Storage  
Umbrella Roof  
Tank



Tank Farm—Umbrella Roof Tanks



Hoisting  
pipe with  
derrick



View of the  
pipe from the  
dam in  
midwinter

Hydro-electric Plant—Altoona, New York

The Pittsburgh-Des-Moines Steel Company laid 16,200 feet of  
72 inch pipe in connection with this job.



Corning, California

A progressive community can advertise itself with its water tower.



Storm Lake, Iowa

Standard Six Post Design.

Capacity—250,000 gallons. Height—100 feet to balcony.



New London, Ohio—City Waterworks

Standard Design.

Capacity—50,000 gallons. Height—92 feet to bottom.

This is a standard all-steel construction especially suitable for municipalities.

## Simplification and Standardization in Production

THE World War taught America the necessity of eliminating waste and conserving labor and material in industry. Unprecedented demands were made upon our industries in order to feed and clothe the allied armies and supply munitions. Production in

### The World War Developed the Need

every line was speeded up to an unheard-of pace and contributed in large part to the winning of the war. In the effort to hasten output and eliminate waste, the idea of standardization received great impetus. Both products and methods of manufacture were analyzed and simplified to insure maximum production.

A marked instance of the success achieved through standardization was the ship building industry. A few, simplified designs were used, all parts were interchangeable, and each part was made by the factory best equipped to produce that article. In the shipyards the equipment was assembled under standardized methods and new ships launched at a rate previously unknown. Similar methods prevailed in the manufacture of munitions and other supplies needed by our armies.

### Standardized Ships

Following the war, the United States Department of Commerce under the direction of Secretary Hoover launched a campaign to carry this war-time lesson to peace-time production. Extensive investigations were made of conditions existing in various important industries. Manufacturers then met in conference and decided upon the designs most essential to their field. In the paving brick industry, sixty-six sizes of brick were studied and discussed, and this number reduced to six. A great saving in cost both to the manufacturer and the consumer was thus achieved by the elimination of unusual or unessential designs. The automotive industry is perhaps the outstanding leader in standardized manufacture, and prices in this field reflect the savings made.

### Department of Commerce Campaign

Standardization of a product does three important things. It assures a high grade article because finer design and workmanship can be developed in a more limited field. It reduces the cost of the product, because of the greater efficiency of the labor involved and the saving in the cost of basic material; both the manufacturer and the consumer benefit by this economy. It speeds up delivery, because the manufacturer can carry a complete stock of both raw materials and finished products. Incidentally it makes it easy to order any desired article, saving time and trouble for the purchaser.

### Benefits Secured

Continuous production can be maintained by producing for stock during slack seasons. This assures steady employment to the workers, and benefits the country as a whole. Thus, labor, the manufacturer, and the consumer all share in the results secured by standardization.

The Pittsburgh-Des Moines Steel Company did not wait for general action to be taken on the question of steel tank standardization. More than a year before the Department of Commerce called for a conference, we had standardized our products. We carry a stock of these tanks and towers which are most generally used, completely fabricated, and ready for shipment. A table of our standardized designs appears on page 39.

### Standard Water Towers

Naturally, in the field of Municipal Waterworks, there is always a demand for towers and tanks of special design to meet unusual conditions. We are always ready to quote on work of this kind, and the quality of our special tanks is as reliable as that of our standard designs.

## Standard Pittsburgh-Des Moines Tank and Tower



## NOTE

To determine size of lot required for a specified size of tank and height of tower take dimensions D and h from table of Standard Tanks, determine H and apply in formula below for S—spread between adjacent column centers at base. Special Towers can be designed for restricted locations.

For sizes of tower members and thicknesses of tank plates, send for standard plans.



SECTION AT X



Dimensions of Piers for all sizes of tanks furnished on application.

PITTSBURGH-DES MOINES  
STEEL COMPANY

Dwg WZ 4

## Standard Tanks and Towers

Capacity In U.S. Gallons & Diameter	Range of Head V	Heights	INDEX NUMBERS OF STANDARD TOWERS										
			1	2	3	4	5	6	7	8	9	10	11
25,000	19' 11"	To Bottom (H)	44' 8"	50' 0"	69' 8"	<b>75' 0"</b>	94' 8"	<b>100' 0"</b>	125' 0"				
15' 0"		To Top (H+V)	64' 7"	69' 11"	89' 7"	94' 11"	114' 7"	119' 11"	144' 11"				
30,000	23' 9"	To Bottom (H)	44' 8"	50' 0"	69' 8"	<b>75' 0"</b>	94' 8"	<b>100' 0"</b>	125' 0"				
15' 0"		To Top (H+V)	68' 5"	73' 9"	93' 5"	98' 9"	118' 5"	123' 9"	148' 9"				
40,000	25' 1"	To Bottom (H)	46' 3"	<b>75' 0"</b>	96' 3"	<b>100' 0"</b>	125' 0"						
17' 0"		To Top (H+V)	71' 4"	100' 1"	121' 4"	125' 1"	150' 1"						
50,000	25' 7"	To Bottom (H)	55' 0"	63' 4"	<b>75' 0"</b>	83' 4"	91' 8"	<b>100' 0"</b>	111' 8"	120' 0"	128' 4"	140' 0"	148' 4"
19' 0"		To Top (H+V)	80' 7"	88' 11"	100' 7"	108' 11"	117' 3"	125' 7"	137' 3"	145' 7"	153' 11"	165' 7"	173' 11"
60,000	29' 9"	To Bottom (H)	55' 0"	63' 4"	<b>75' 0"</b>	83' 4"	91' 8"	<b>100' 0"</b>	111' 8"	120' 0"	128' 4"	140' 0"	148' 4"
19' 0"		To Top (H+V)	84' 9"	93' 1"	104' 9"	113' 1"	121' 5"	129' 9"	141' 5"	149' 9"	158' 1"	169' 9"	178' 1"
75,000	30' 6"	To Bottom (H)	55' 0"	63' 4"	<b>75' 0"</b>	83' 4"	91' 8"	<b>100' 0"</b>	111' 8"	120' 0"	128' 4"	140' 0"	148' 4"
21' 0"		To Top (H+V)	85' 6"	93' 10"	105' 6"	113' 10"	122' 2"	130' 6"	142' 2"	150' 6"	158' 10"	170' 6"	178' 10"
100,000	31' 0"	To Bottom (H)	50' 0"	63' 1"	<b>75' 0"</b>	79' 7"	91' 6"	<b>100' 0"</b>	113' 1"	116' 6"	125' 0"	141' 6"	153' 4"
24' 0"		To Top (H+V)	81' 0"	94' 1"	106' 0"	110' 7"	122' 6"	131' 0"	144' 1"	147' 6"	156' 0"	172' 6"	184' 4"
200,000	36' 1"	To Bottom (H)	50' 0"	75' 0"	100' 0"	125' 0"	150' 0"						
32' 0"		To Top (H+V)	86' 1"	111' 1"	136' 1"	151' 6"	186' 1"						

**Boldface Type** indicates towers and tanks already fabricated and in stock.

Other towers listed indicate material in stock for immediate fabrication, drawings and templates completed.

Any towers of height not listed are special. Drawings must be prepared before fabrication.

Our Company is practically the only builder of elevated tanks that has standardized the towers and that carries them in stock. Other manufacturers must fabricate all towers after the order is received.

## Standard Tank Dimensions

Rated Capacity U.S. Gal	Diam. D	Range of Head V	Cylinder C	Distance h	Rated Capacity U.S. Gal	Diam. D	Range of Head V	Cylinder C	Distance h
10,000	11' 0"	14' 11"	10' 11"	4' 0"	75,000	21' 0"	30' 6"	22' 6"	8' 0"
15,000	13' 0"	16' 11"	10' 11"	6' 0"	100,000	24' 0"	31' 0"	22' 6"	8' 6"
20,000	15' 0"	16' 2"	10' 9"	5' 5"	150,000	28' 0"	34' 7"	24' 2"	10' 5"
25,000	15' 0"	19' 11"	14' 7"	5' 4"	200,000	32' 0"	36' 1"	23' 4"	12' 9"
30,000	15' 0"	23' 9"	18' 5"	5' 4"	250,000	32' 0"	45' 4"	31' 4"	14' 0"
40,000	17' 0"	25' 1"	18' 5"	6' 8"	300,000	36' 0"	42' 5"	28' 4"	14' 1"
50,000	19' 0"	25' 7"	17' 7"	8' 0"	500,000	44' 0"	49' 2"	29' 9"	19' 5"
60,000	19' 0"	29' 9"	22' 6"	7' 3"	1,000,000	50' 0"	73' 9"	52' 0"	21' 9"



Dinuba, California—City Waterworks

Standard Design. White tank on a black tower.  
Capacity—200,000 gallons. Height—135 feet to top of tank.  
Old wood tanks are invariably replaced by elevated steel tanks which  
are quickly erected and last indefinitely.

# Weights of American Waterworks Association Standard Bell and Spigot Cast Iron Pipe

Classes A, B, C and D

Nom. Inside Dia. of Pipe	CLASS A 100 Feet Head 43 Lbs. Pressure				CLASS B 200 Feet Head 86 Lbs. Pressure				Approx. Lbs. Lead Per Joint 2 in. Deep	Approx. Lbs. Lead Per Joint 2 1/2 in. Deep	Approx. Lbs. Hemp Per Joint
	Weight of 12' Per		Weight of 16' Per		Weight of 12' Per		Weight of 16' Per				
	Foot	Length	Foot	Length	Foot	Length	Foot	Length			
3	14 5	175	-	-	16 2	194	-	-	6 00	1 88	.18
4	20 0	240	19 7	315	21 7	260	21 2	340	7 50	2 50	.21
6	30 8	370	30 3	485	33 3	400	32 5	520	10 25	3 40	.31
8	42 9	515	42 2	675	47 5	570	46 6	745	13 25	4 38	.44
10	57 1	685	55 9	895	63 8	765	62 5	1000	16 00	5 33	.53
12	72 5	870	71 2	1140	82 1	985	80 6	1290	19 00	6 25	.61
14	89 6	1075	-	-	102 5	1230	-	-	22 00	7 50	.81
16	108 3	1300	-	-	125 0	1500	-	-	30 00	10 00	.94
18	129 2	1550	-	-	150 0	1800	-	-	33 80	10 95	1 00
20	150 0	1800	-	-	175 0	2100	-	-	37 00	12 50	1 25

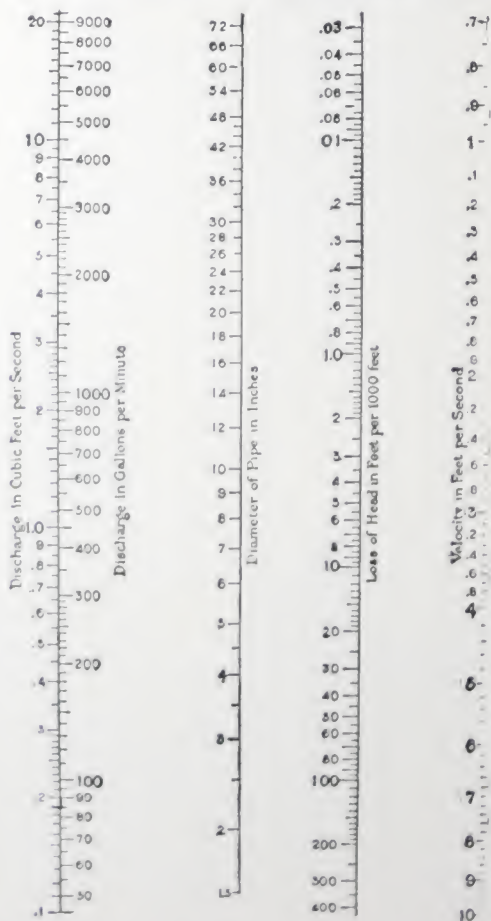
Nom. Inside Dia. of Pipe	CLASS C 300 Feet Head 130 Lbs. Pressure				CLASS D 400 Feet Head 173 Lbs. Pressure				Approx. Lbs. Lead Per Joint 2 in. Deep	Approx. Lbs. Lead Per Joint 2 1/2 in. Deep	Approx. Lbs. Hemp Per Joint
	Weight of 12' Per		Weight of 16' Per		Weight of 12' Per		Weight of 16' Per				
	Foot	Length	Foot	Length	Foot	Length	Foot	Length			
3	17 1	205	-	-	18 0	216	-	-	6 00	1 88	.18
4	23 3	280	22 8	365	25 0	300	24 4	390	7 50	2 50	.21
6	35 8	430	35 0	560	38 3	460	37 5	600	10 25	3 40	.31
8	52 1	625	50 9	815	55 8	670	54 7	875	13 25	4 38	.44
10	70 8	850	69 4	1110	76 7	920	75 3	1205	16 00	5 33	.53
12	91 7	1100	90 0	1440	100 0	1200	98 4	1575	19 00	6 25	.61
14	116 7	1400	-	-	129 2	1550	-	-	22 00	7 50	.81
16	143 8	1725	-	-	158 3	1900	-	-	30 00	10 00	.94
18	175 0	2100	-	-	191 7	2300	-	-	33 80	10 95	1 00
20	208 3	2500	-	-	229 2	2750	-	-	37 00	12 50	1 25

All dimensions are in inches. All weights are in pounds. Weight per foot includes allowance for bell. Weight per length includes standard bell. Dimensions and weights are approximate.

The difference in weight per foot of 12 foot and 16 foot lengths is due to the weight of the bell being spread over longer lengths.

"Centrifugal" Pipe, made by a patented process, is somewhat lighter in weight than the class of sand-cast pipe in place of which it is used. It is made in 12 foot lengths, and 6, 8, 10, and 12 inch diameters.

# Diagram for Calculating Pipe Sizes, Discharge, Velocities, and Loss of Head



Lay a straight edge on scales at the points for any two known quantities and the unknown quantities will lie at the intersection of the straight edge with the other scales.

## Useful Information

One cubic foot of fresh water 62 degrees F. weighs 62.36 pounds.

One United States gallon of fresh water weighs 8.33 pounds.

One cubic foot is equivalent to 7.48 U. S. gallons.

One U. S. gallon contains 231 cubic inches.

2.31 feet depth of fresh water will produce a pressure of one pound per square inch, therefore to find the pressure per square inch of a column of water, divide its height in feet by 2.31 or multiply by .433.

To compute the horse power required to elevate water to a given height, multiply the number of gallons raised per minute by 8.33 and by the total vertical height in feet between the surface of water in well and surface of water in standpipes or reservoir, and divide the product by 33000. Add from 60 per cent to 100 per cent for friction and other losses in determining size of engine.

### Table of Fire Streams

	¾ in. Smooth Nozzle					⅞ in. Smooth Nozzle					1 in. Smooth Nozzle				
Pounds pressure at Nozzle .....	20	30	40	50	60	20	30	40	50	60	20	30	40	50	60
Pounds pressure lost in each 100 feet 2½ in. hose .....	1.4	2.1	2.9	3.6	4.2	2.6	4.0	5.2	6.5	8.0	4.7	6.7	9.0	11.3	12.7
Vertical height of Stream.....	38	53	72	81	91	38	56	73	85	94	39	57	74	87	97
Horizontal distance of Stream.....	50	68	77	89	99	55	75	91	97	108	58	78	97	106	115
Gallons discharged per Minute.....	68	82	95	106	116	92	113	130	145	160	125	147	170	190	209

The horizontal and vertical distances given are for fair fire streams under average condition. The extreme distance reached is from 15 per cent to 45 per cent greater than the above, but the stream will be broken into spray or large drops.

## Weights

1 cu. in. cast iron weighs	0.260 pounds
1 cu. in. wrought iron weighs	0.280 pounds
1 cu. in. water weighs	0.036 pounds
1 U. S. gallon weighs	8.330 pounds
1 Imperial gallon	10.000 pounds
1 U. S. gallon equals	231.000 cu. in.
1 Imperial gallon equals	277.274 cu. in.
1 cu. ft. water equals	7.480 U. S. gallons
1 pound steam equals	27.222 cu. ft.
1 pound air equals	13.817 cu. ft.

## How to Convert Weights and Measures

Feet	x	.00019	= miles
Yards	x	.0006	= miles
Sq. in.	x	.007	= square feet
Sq. ft.	x	.111	= square yards
Sq. yds.	x	.0002067	= acres
Acres	x	4840	= square yards
Cubic in.	x	.00058	= cubic feet
Cubic feet	x	.03704	= cubic yards
Cubic feet	x	7.48	= U. S. gallons
Cubic ins.	x	.004329	= U. S. gallons
U. S. gals.	x	.13367	= cubic feet
U. S. gals.	x	.231	= cubic inches
Cu. ft. water	x	62.5	= pounds (avoirdupois)
Cu. in. water	x	.03617	= pound (avoirdupois)
1 ton			= 268.6 U. S. gallons of water
1 ton			= 35.84 cubic feet of water

## History of the Pittsburgh-Des Moines Steel Company

THE business now being carried on by the Pittsburgh-Des Moines Steel Company, began as a partnership formed by W. H. Jackson and B. N. Moss in 1893 under the firm name of Jackson & Moss, Engineers and Contractors. This firm had its headquarters at Des Moines, Iowa and specialized in the building of waterworks plants. Mr. Jackson had previously been City Engineer of Fort Madison, Iowa and Mr. Moss had been employed on construction work in Chicago.

In 1899, E. W. Crellin, who had for several years been engaged in contracting for waterworks plants and general steel construction in Iowa and adjoining states, started the erection of a bridge factory at Des Moines, Iowa.

In March 1900, the firm of Jackson & Moss and Mr. Crellin joined in the organization of the Des Moines Bridge and Iron Works. The new company continued the waterworks contracting of the old firm and also added the fabrication and erection of bridges and steel structures. This Company has had a very large share in the building of the Central West. More than a third of the waterworks systems of Iowa have been built wholly or in part by this organization.

At the time Jackson & Moss entered the waterworks field, there were very few steel structures used for the storage of water. The larger cities used earth or masonry reservoirs and the small towns stored water in wooden tanks, elevated upon wooden water towers. Jackson & Moss introduced the substitution of economically designed steel towers for the old style wooden towers and secured a patent upon this style of construction in 1896. They were among the earliest builders of hemispherical bottom steel tanks for the storage of water.

Within a few years the Des Moines Bridge and Iron Works

were building elevated steel tanks in practically every state in the Union. This made it desirable to have an eastern factory and in 1907 a plant was started at Pittsburgh, Pennsylvania. The branch soon outgrew the home business and Mr. Crellin and Mr. Jackson moved to Pittsburgh. The name of the business was then changed to the Pittsburgh-Des Moines Steel Company.

The Company's activities have steadily expanded and now include many additional lines beside bridge and tower construction. Prominent among these is the construction of radio towers. Messages may be sent around the world using the radio towers built by this Company at Porto Rico, New Orleans, Great Lakes, Mare Island, Guam, Manilla, and Bordeaux, France. The last named station is known as the LaFayette Radio Station and consists of 8 self supporting steel towers 820 feet high. This was built for the United States government during the war and is recognized as the largest of its kind in the world.

The company's other activities during the war embraced the construction of the waterworks features of the cantonment at Camp Dodge, the furnishing of a large number of government water towers—two of which were in service at Fort Oglethorpe within 28 days from the date of contract—and the furnishing of thousands of tons of steel for the so-called "Fabricated Ships" program. In recognition of this service one of the ships was christened "Des Moines Bridge".

After the armistice, and in view of the large and well balanced organization that had been created, the Pittsburgh-Des Moines Steel Company entered the general contracting field in the eastern territory, and has since become well known not only in the construction of municipal water supply and filter plants, but also in the building of railway water supply and softener plants.

During the past thirty years, we have built municipal waterworks systems in every part of the United States—in small towns as well as large communities. We can, therefore, offer you a broad and varied experience to solve the problem of an adequate, up-to-date water supply for your town.

**I**F you contemplate building a waterworks system or making improvements to your present plant, write to the nearest Pittsburgh-Des Moines Office for advice or information. The request places you under no obligation, for we are always glad to assist you.

**FILL OUT THIS SHEET AND SEND IT IN:**

1. *Name of your community* .....
2. *Population of your community* .....
3. *Present type of water system* .....
4. *Present kind of power* .....
5. *Source of water supply* .....
6. *Amount of funds*  
*available for water improvements* .....
7. *Present indebtedness of town* .....
8. *Limit of indebtedness of town* .....
9. *Assessed valuation of property* .....
10. *Name of Consulting Engineer* .....
11. *Name of City Engineer* .....
12. *Name of Mayor* .....
13. *Name of Clerk* .....
14. *Dates of regular Council Meetings* .....

*This sheet filled out by* .....

*Title* .....

*Address* .....

*Date* .....

*Please give us a brief statement of your proposed improvements.*

.....

.....

.....

## Pittsburgh-Des Moines Steel Company

---

### SALES OFFICES

800 Curry Bldg.,  
Pittsburgh, Pennsylvania

1254 First National Bank Bldg.,  
Chicago, Illinois

316 Rialto Bldg.,  
San Francisco, California

1217 Praetorian Bldg.,  
Dallas, Texas

9th and Tuttle Streets,  
Des Moines, Iowa

1161 Book Bldg.,  
Detroit, Michigan

50 Church Street,  
New York City

1211 Virginia Railway & Power Bldg.,  
Richmond, Virginia

### SHOPS

Pittsburgh, Pennsylvania

Des Moines, Iowa

### CANADIAN COMPANY

Canadian-Des Moines Steel Co., Ltd.

### SALES OFFICES

278 Inshes Avenue,  
Chatham, Ontario

70 St. James Street,  
Montreal, Quebec

### SHOP

Chatham, Ontario



